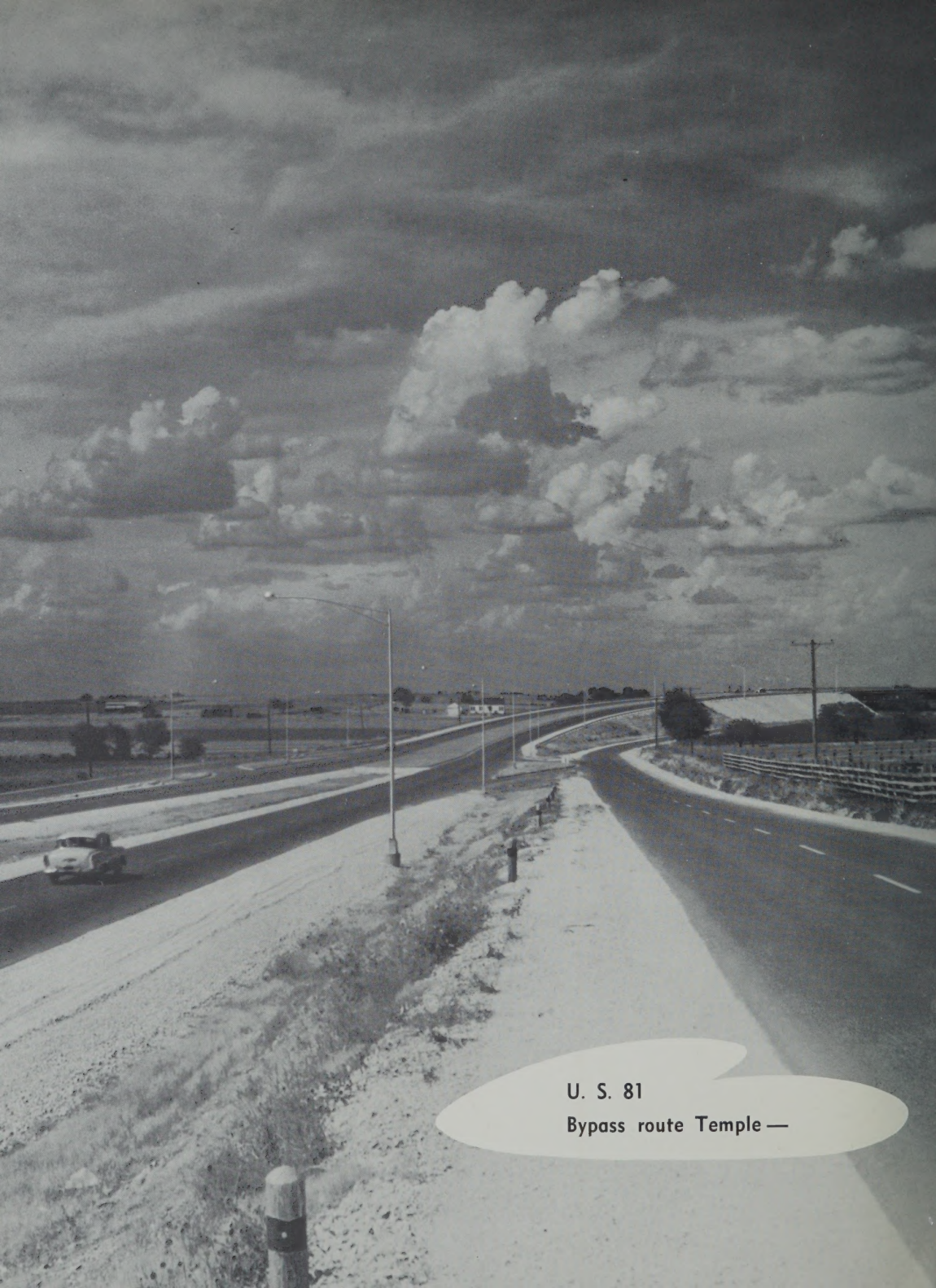
Texas Highways

March, 1957


U. S. 81
Bypass route Temple —

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The route of the tunnel under the Houston ship channel is indicated by the white dash lines. It measures 3,009 feet, portal to portal, and has open approaches 551 feet longer on each end.

The Baytown - La Porte

Foyest W. Brown, Senior Designing Engineer
District 12

The Baytown-La Porte Tunnel, under the busy Houston Ship Channel, was opened to traffic September 22, 1953, and presently has a volume of approximately 11,000 vehicles daily. This exceeds estimates made prior to completion of the tunnel for 1958.

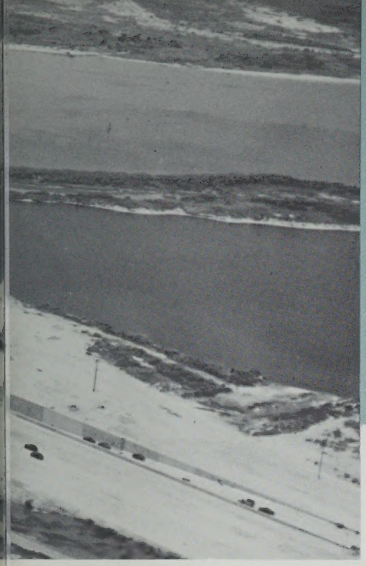
The tunnel is maintained and operated by a force of 38 men under the supervision of Travis McKinney, Tunnel Superintendent. Fifteen of these men act as guards, with four guards on duty at all times to assist and direct traffic through the tunnel. One guard is stationed at each end of the tunnel, and two are inside. Telephones at frequent intervals along the tunnel permit guards to report accidents.

Since its opening there has been only one accident in the tunnel, and this occurred when several cars were stopped and the brakes on a water truck failed. The driver reduced his speed by holding the wheel against the curb, but one parked car was damaged. There were no injuries.

When a vehicle becomes disabled in the tunnel, a call is sent out for the crash truck. This truck, designed as a crash truck and fire truck, is capable of removing any vehicle that is allowed to use the tunnel.

Occasionally some people, especially elderly people, request that a guard drive their automobile through the tunnel. Once in a great while, someone becomes frightened after entering the tunnel and a guard is requested to drive them through.

The tunnel gets its weekly bath each Monday night starting at 10 o'clock and ending about 6 o'clock Tuesday morning. It takes 20 to 30 gallons of water and 20 gallons of liquid detergent to clean the tunnel weekly. A specially designed truck is used in the washing operations. Traffic is halted while the truck is sent through to spray water and soap on the tunnel interior. The soap and water are washed off the walls on successive trips by the truck.

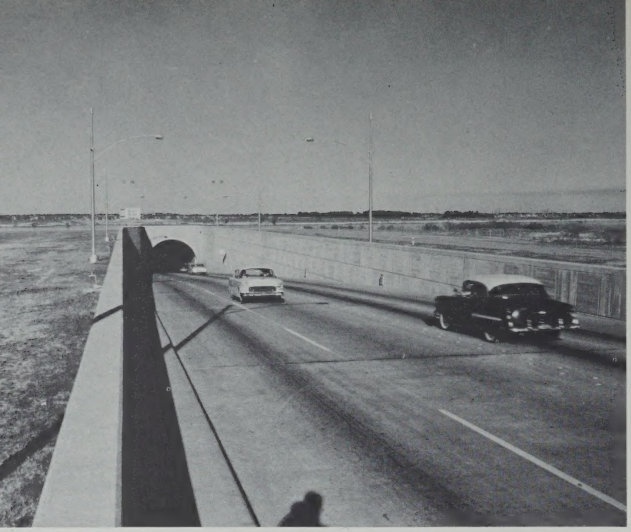


If you have ever driven through the Baytown-La Porte Tunnel, you might have wondered what would happen if you had a wreck, panicked, or had a flat tire in the middle of the tunnel. You might even have wondered if there was enough fresh air to breathe, and if so, where it was coming from. One look at the walls and roadbed make it clear that someone is doing a good job of cleaning the 3,009-foot subaqueous tunnel. Maintenance of the tunnel is a round-the-clock job, and facts concerning this operation follow.

It takes 38 men to maintain and operate this subterranean highway known as the Baytown Tunnel. A weekly bath keeps it clean, and air in the tunnel is completely changed every two minutes.

Tunnel

The roadway in the tunnel is 24 feet wide and the vertical clearance is fourteen feet. The lowest point on the roadway is 76 feet below mean low water. Since the tunnel cannot carry overheight trucks, there is a road going up over the tunnel which allows these trucks to turn around. One of the many questions people ask the guards is, "Why can't I take the overheight truck route over the channel instead of going through the tunnel?" A favorite story circulated about a guard working the late shift tells of an intoxicated gentleman pulling up to the guardhouse and requesting the guard to drive his vehicle through the tunnel. Allegedly, the



Entering the tunnel from the south approach, the ventilation building can be seen at the opposite side of the tunnel. Exit lanes widen from eleven to 23 feet beyond portals.

This six-story building located on the Baytown side houses the tunnel controls. There are three stories above ground, and three beneath the ground.

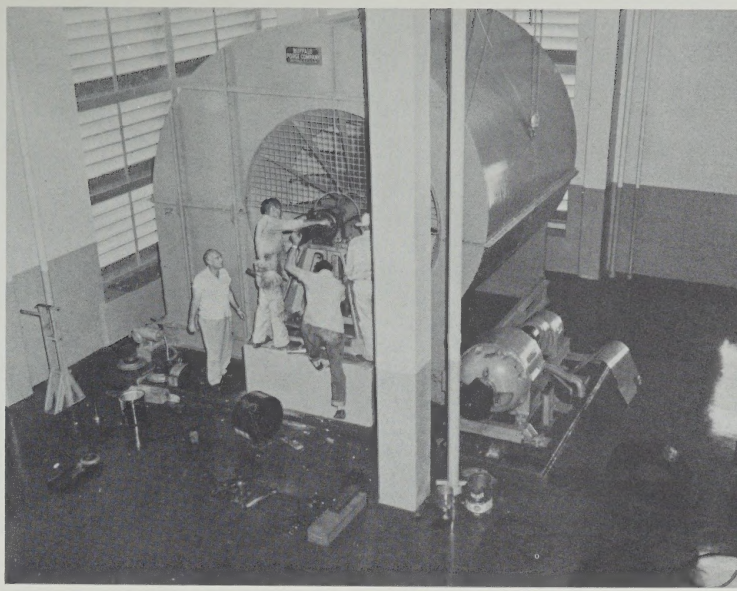
guard told the gentleman to walk across the street to the crash truck garage and wait. The guard then supposedly drove the car around the overheight truck route and stopped beside the crash truck garage. The grateful man thanked the guard and happily drove off in the same direction from which he had come.

Many people are bothered by the fact that ships are going over the channel while they are going under. Out-of-state cars are often amazed by the fact that there is no toll charge for use of the tunnel. People often comment that the Baytown-La Porte Tunnel is the cleanest and best-lighted tunnel they have ever seen.

Lights throughout the tunnel are changed as they burn out, and each year the entire system of lights is

This carbon-monoxide detector warns the control tower operator, Lawrence Wright, if the air becomes impure.

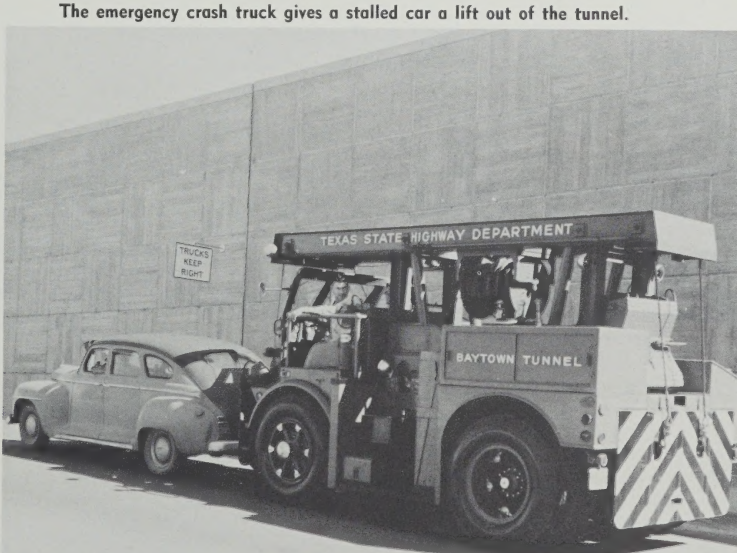
replaced. Fresh air is maintained throughout the tunnel by three large fans, each capable of furnishing 200,000 cubic yards of air per minute. Normally two of the fans are in operation at all times. During peak hours the fans are speeded up to pro-

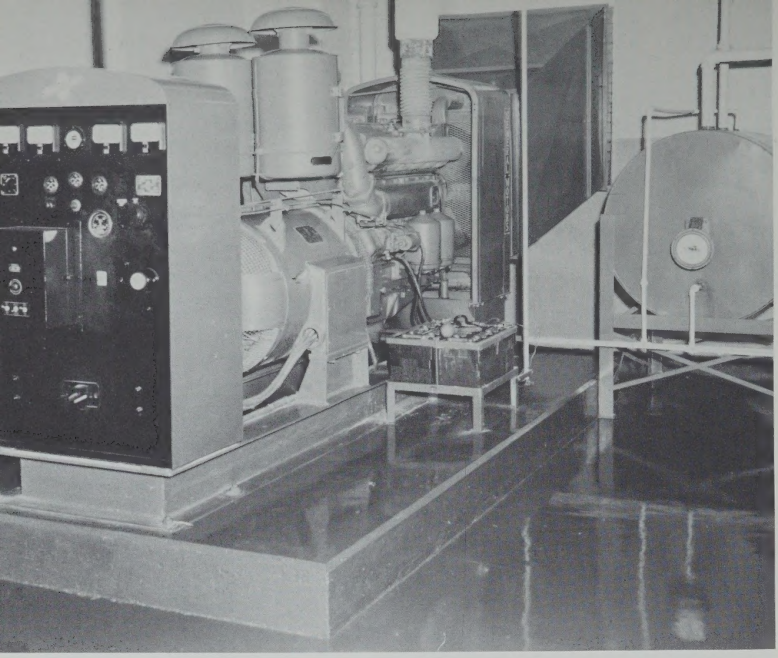


This and two other giant blowers force air through the tunnel, providing proper ventilation. Maintenance men give this blower a thorough going-over.

The tunnel is getting its weekly bath with the specially built truck.

The emergency crash truck gives a stalled car a lift out of the tunnel.



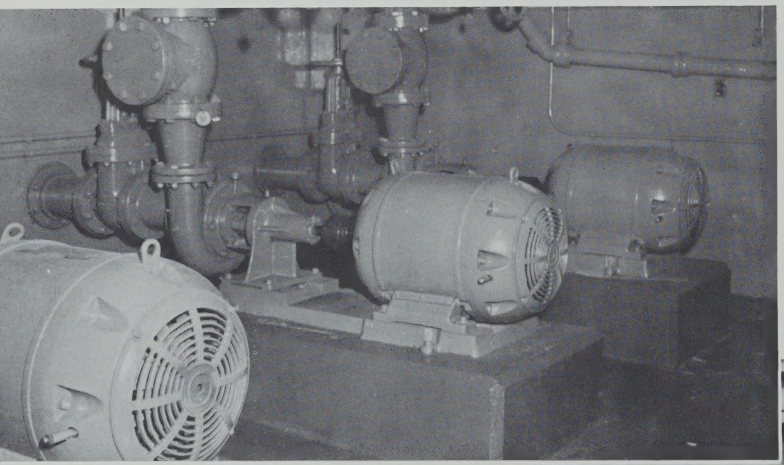


In case of power failure, this 150-kilowatt, diesel-powered emergency generator is put into operation within minutes.

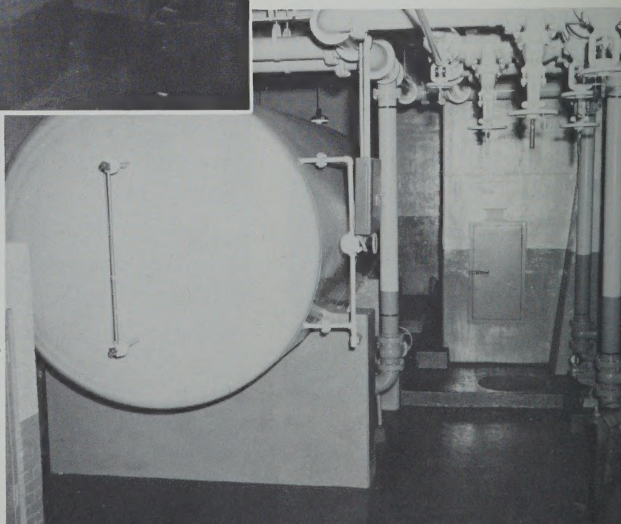
Every thirteenth light in the tunnel is connected to the direct current circuit which takes over the exact minute of power failure. Pictured here is the battery room.

vide more ventilation. Air in the tunnel is completely changed every two minutes.

Panic could overtake traffic fast if the lights were to fail. The tunnel is serviced by 12,000-volt commercial power for each end of the tunnel. This service has been interrupted on one side during thunder storms on many occasions, but only three times have both sources become unavailable at the same time. Twice commercial power was off for fifteen minutes, and once for 45 minutes. At the instant commercial power fails, a battery-driven D.C. motor drives an A.C.



These pumps are used to drain rain water out of the tunnel. They are in the ventilation building.



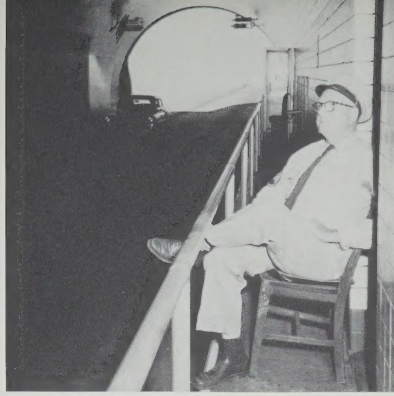
Water is fed into the Baytown Tunnel water system from this large tank.

Wright checks the electrical apparatus in the control room.

generator which provides power to operate each thirteenth light throughout the tunnel. As this unit is not large enough to furnish power for all lights, pumps, and ventilation changes, it is necessary that a larger emergency power be used. Within minutes after failure of commercial power, a 150-kilowatt, diesel-driven generator is brought into operation. This generator will furnish power for all the tunnel lights and pumps and provide enough power to furnish ventilation. Since the opening of the tunnel the use of this generator has been necessary only one time for a period of 45 minutes.

The temperature during the summer inside the tunnel is about ten degrees below outside temperature. During the winter, it is about ten degrees warmer.

To date, there have been no fires. However, they are well prepared. Traffic light controls allow guards to stop traffic should the need arise for any reason. The guard has at his disposal a fire extinguisher and a regular fire hose. If this is not sufficient, the combination fire truck and wrecker may be called to assist.



Four tunnel guards watch traffic and control traffic flow in an emergency. Here, James R. Covin is on duty near the north portal.

There are always comical aspects in the day-to-day routine of the tunnel operation. Since it is limited to vehicular traffic, guards occasionally provide transportation through the tunnel for bicycles and pedestrians. For a time, they were plagued by a young man who insisted on attempting to go through on a small motor bike which did not have sufficient power to make the entire trip. About three-fourths of the way through, the bike would stall, and the guard would call for the crash truck to take him the rest of the way. After this occurred numerous times, the guard, instead of calling for the wrecker, had the boy push the motor bike out by hand. Since he has not been back, he evidently made other arrangements for transportation.

Total cost for construction of the tunnel project and approach roads was $10,205,905.96.

Practically all employees who were operating the Morgans Point ferries were transferred to the Baytown-La Porte Tunnel. Before the tunnel was constructed, traffic going from one side of the Ship Channel to the other had to go all the way around by land, or use the ferries. Ferryboat pilots became control room operators; deck hands and utility men became guards and utility men in the tunnel. Captain Leon D. Rice was Assistant Ferry Manager and now is the Assistant Tunnel Superintendent.

Guards check height and width of trucks and vehicles with trailers to make sure they are not oversize.

It's no dog's life in the Del Rio District for Betsy and her family.

Louis Salvatierra, Skilled Laborer, and Le Roy Thomas, Senior Draftsman, pose with the Del Rio coffee hounds.

COFFEE HOUNDS

Le Roy Thomas, Senior Draftsman
District 22

District 22 is probably the only district in the state that can boast of having a dog who conscientiously observes two coffee breaks daily during the work week.

Betsy was adopted by our late District Engineer M. B. Hodges when he noticed her on the office grounds, limping from an injured leg. Mr. Hodges had the dog treated by a veterinarian, and upon her release she returned to the grounds to stay.

While Mr. Hodges was out on his district inspection trips, Betsy would lie in the driveway where he always parked his car, awaiting his return. After he left for his final trip to a hospital in San Antonio, she was inconsolable for days and off her feed.

Betsy finally became adjusted to Mr. Hodges' absence and assumed the position of watchdog for the grounds. State employees were greeted with a wagging tail, but outsiders were greeted with a growl and bared fangs. The growl and fangs were pure bluff on her part, but very convincing. It continues to amaze us how she can unfailingly distinguish between state employees and those not of our fraternity. Possibly the haggard, exhausted appearance of state employees provides the necessary clue.

After Mr. Hodges had been away about three weeks, it became apparent that Betsy was not devoting her time completely to guarding the premises. One of our Accountants noted that she "sure was eating good, and fattening up."

Four of Betsy's puppies survived and were taken to heart by all the employees and their children. The veterinarian now prescribed a daily candy bar for Betsy, which she receives at coffee time. Our signal for "coffee ready" is four blasts of the whistle. This whistle blows continually during the day, calling various supervisory employees to their offices, but Betsy will only wake from her cat-chasing dreams upon the fourth blast — when she leaps up and streaks for the coffee shack. Quite similar, we suppose, to other state employees outside of this district who may doze all day, to waken only for their coffee breaks.

No matter how many foster masters she may have while with us, Betsy is, and always will be "Mr. Hodges' dog" to all of us.

The SLIP-FORM PAVER

A. B. Middleton, Senior Resident Engineer
District 20

Slip form, or formless paving, is a new and revolutionary method for placing portland cement concrete pavement using the Quad City slip-form paver. This paver is a precision machine, but like any other precision machine, it must be properly operated and properly applied. This is not difficult when a well-compacted, accurate subgrade is provided, applying emphasis to the accuracy and compaction of the grade-control strips at each side of the slab area where the crawler tracks of the paver and subgrade planer or subgrade finisher must travel.

The ability of concrete slab edges to stand without forms before the initial set takes place is due to a phenomenon of stabilization of portland cement concrete when subjected to a simultaneous application of vibration and compression. Because of this phenomenon the concrete can

The subgrade planer on tracks operates on the same grade strips as the formless paver.

These two 34-E pavers are used in paving operations.

be made to remain stable, if it is not disturbed, until the initial set introduces rigid consolidation. The slip-form or sliding-form method allows removal of the form support without sufficient disturbance to overcome the stability and cause slumping of the edges.

The tracks on the Quad City slip-form paver are so designed that sets of two rollers support a 22-foot straight edge at six-inch intervals. This design distributes the load of the machine, effectively reducing the track pad pressure to a minimum, and results in an effect similar to a 22-foot straight edge sliding over a roller conveyor. The finished surface of the concrete slab originates at the approximate center of the straight edges, reducing any irregularities in the grade-control strips. From the foregoing it is easily understood that the key to a good riding facility of the finished pavement surface is accurately graded, well-compacted grade-control strips for the tracks of the subgrade finishing equipment and the tracks of the slip-form paver to travel on.

To obtain accurate grade-control strips which will eliminate the long waves that become apparent at high automobile speeds, blue tops should be set at not more than 25-foot intervals. By stretching a string line approximately two feet outside the pavement edge and supporting it at grade by the use of steel form pins driven into the ground at the same intervals as the blue tops, an accurate reference line can be maintained. The grade-control strips can be rough graded with a motor patrol and checked at

Here, the mixed concrete is deposited ahead of the formless paver.

the string line for fine grading by hand. The string line on the operator's side of the Quad City slip-form paver may also be used for maintaining horizontal alignment by hanging a plumb bob from a gauge attached near the front of the paver track.

For slip-form paving the use of air-entraining cement is recommended because the improved workability of low-slump concrete aids in obtaining complete compaction. Entrained air reduces surface bleeding, thereby reducing the likelihood of edges slumping. Laboratory tests have proven that there is no appreciable loss of strength due to air entrainment up to the approximate 4 per cent quantity that is required. A one-and-one-half- to two-inch slump has been found to give the most satisfactory results.

On December 13, 1955, a contract was awarded to Austin Bridge Company and Austin Road Company of Dallas, for grading, structures, and concrete pavement on State Highway 73 between Old and Lost River Bridge at Cove and the Harris County Line —a distance of 6.593 miles. This project called for dual lanes of pavement twenty-four feet in width and twelve inches thick, to be placed on a minimum of four and one-half inches of sand-shell base and topped with one inch of hot-mix asphaltic concrete. The project also provided for frontage roads along each side for the entire length of the project. A work order was issued on December 13, 1955, and work began on December 29, 1955.

Paving operations started on October 2, 1956, using the Quad City slip-form paver. For the first two weeks the paving operations were carried on using one 34-E dual drum paver. After two weeks had elapsed a second 34-E dual drum paver was placed on the job and remained until all pavement on which the slip-form paver could be used was completed on December 7, 1956. A total of 45 days was used on the paving

The strike-off levels the concrete ahead of the vibratory screeds and placing of tie bars.

This close-up shows the view of the vibratory screed and tamping bars.

This is the way the slab looks after the paver has completed its job.

The slab looks like this after forms have moved on and before edges have been finished.

operations and an average of 1,400 linear feet of pavement per day was placed. This amounts to a total average of slightly under 900 batches a day. The largest single day's run amounted to 1,934 linear feet, or 1,228 batches. If the short days on which breakdowns occurred were omitted this average would be increased.

On this particular job the daily production was also limited by the small working area at the batching plant. Had the area at the batching plant not been limited the contractor could have used more batch trucks, thereby increasing his production on the road. The Quad City slip-form paver was not able to operate continuously because of the shortage of batch trucks.

This project is being constructed using shell aggregate instead of gravel. The use of shell as an aggregate in concrete pavement is nothing new. We have roads in the state which were paved with shell concrete back in the Thirties which are still giving us good service. One disadvantage of using shell concrete with the slip-form paver is that it is very difficult to control surface bleeding. If it becomes excessive, as it will in the Coastal areas due to the high humidity, this bleeding will cause some slumping of the edges after the forms have moved on. When this occurs the contractor uses forms to contain the concrete until it has attained its initial set.

A very important factor in placing concrete pavement using the slip-form paver is rigid control of uniformity of the batch. Where two pavers are used it is essential that the water meters on the two pavers be synchronized to be sure that the amount of water added to each batch from each paver is the same. Close supervision is required at the stock-

The completed dual-lane pavement, after sand-shell shoulders are in place, looks like this before hot mix is laid and shoulders are surfaced.

Looking back on completed slab, a dark area can be seen in the background.

This section has received an application of emulsified asphalt curing.

pile to see that material is properly handled to assure uniform moisture in each batch.

During this 45 days of paving the contractor completed 61,888 linear feet, or 11.72 miles, of 24-foot, 12-inch- thick pavement. This entailed 165,043 square yards of pavement, or 55,014 cubic yards. The contractor used a total of 276,063 sacks, or 69,016 barrels, of cement and poured 39,296 batches. The amount of cement required for this work totaled 274,870 sacks, or 68,742 barrels. This represents an overrun of 1,093 sacks, or 274 barrels. Percentage wise this is an overrun of 0.40 per cent. A portion of the job has already been cored and the thickness is running twelve inches or better.

In all, 346 test beams were made on this job and the final adjusted average break at seven days was 477 pounds. The job was set up with a minimum of 450-pound beam strength with a minimum of five sacks of cement per cubic yard of concrete. As evidence of the speed with which this machine operates, the contractor on this job received an estimate for the month of October, 1956, of $322,-466.48, and for the month of November in the amount of $345,108.74.

Mechanical failures in the slip-form paver caused loss of time and expense to the contractor on this job. The main source was the frequent twisting out of shafts in the motors which propel the machine. It is the belief of the writer that the contractor has the solution for this trouble and will have it corrected before the machine is again placed in operation. His intention is to replace the present strike-off bar with a different type mechanical spreader, which should lighten the load on the machine, and to replace the smaller shafts in the motors with larger ones. This should correct this condition and result in better over-all performance of the machine and a better finished product.

The formless paver will probably replace the present method of placing concrete pavement using the conventional side forms in a very short time. When this change-over occurs, the Highway Department will realize a saving in the cost of placing concrete pavement. On an adjacent section of Highway 73 in Harris County on which bids were received last month, there was evidence of this saving. Applying the low bid on concrete pavement on the Harris County job to this job there would have been a saving of more than $50,000, or roughly $8,000 per mile. As more contractors in Texas purchase this type of paving equipment and the competition becomes greater, it is reasonable to believe that the saving to the state will be even greater.

THE

In the eight counties comprising District 22 in Southwest Texas, ranching, tourist trade, and commerce with Mexico are the principal industries. Terrain, crisscrossed by 1,538 miles of state-maintained road, varies from the rough canyons and plateaus in the northern half of the district to the level irrigated farm lands of the Rio Grande Valley.

District 22 came into being in March, 1932, when the number of Highway Department districts was increased from eighteen to twenty-five. Headquarters for the district changed from Uvalde to Del Rio in September, 1933. There are 236 employees currently assigned to carry out the work load of District 22.

One of the projects is the rebuilding of the Pecos River Bridge on U. S. 90. The old bridge was destroyed by flood waters in June, 1954. Soon to be completed, the new bridge will be the highest on the state highway system — 273 feet above the normal water line.

Many of the highways of District 22 follow routes similar to those used by the Spaniards in the Seventeenth Century. Spanish explorers and travelers crossed Zavala County as early as 1691, and the trail from San Antonio became known as the Old San Antonio Road. It was designated a state highway by the Texas Legislature in 1929.

The first road across Val Verde County opened in 1849. A military road, its route crossed westward from San Antonio to Del Rio. Passenger and mail service was inaugurated on this route 100 years ago. Though probably more heavily traveled than any other section of Texas in those early times, the population of the area remained scant due to the Indian raids which continued until the late

Chester N. Parsons, District Engineer, and Gladys Hinkle, Senior Secretary, transmit maintenance projects to D-18.

DISTRICTS PASS IN REVIEW

District 22

1880's.

Part of the present State Highway 163 of this district was once an important segment of the Chihuahua Trail which followed the Devil's River watering holes. Watering places in the pioneer days had to be close enough for animals and men to reach in a day's journey. The Devil's River gorge has some of the most scenic and most rugged territory of the state.

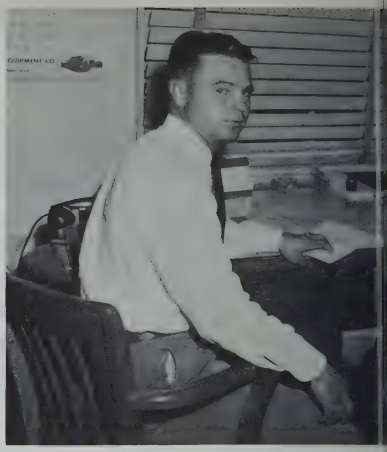
Hunting in District 22 lands gives the sportsman excellent seasons on deer, turkey, dove, quail, and whitewing. There is good game cover, and landowners gain considerable revenue from leasing land to hunters from all parts of the state.

Another attraction for the sightseer in this area is the Roy Bean Museum in Langtry on U. S. 90. "The Law West of the Pecos" is attributed to Bean, who was elected justice of the peace in 1885 and ran his combination saloon and courthouse, the Jersey Lilly, until his death in 1903.

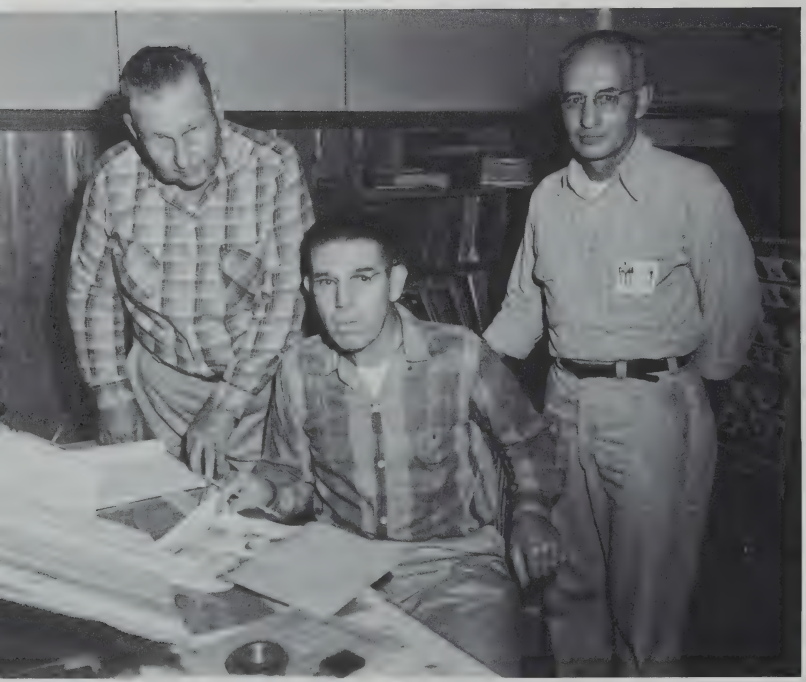
Accounts get a going over from Malcolm A. Gordon, District Bookkeeper; Jeanette Hershberger, District Office Clerk; and Kenneth Bond, Senior Accountant.

E. A. Boehme, Chief District Accountant, and Martha Jean Sawyer, District Office Clerk, review lease agreements covering maintenance patrol camps.

Discussing requisitions of material and supplies are Martha Jean Sawyer, District Office Clerk, and Lillian C. Green, Junior Clerk.



Edward L. Sanders Jr., District Maintenance
cuss signing of the intersection of U. S. 90 c



Material about a machine for removing traffic line paint from pavement gets the attention of Charles W. Miller, Senior Equipment Supervisor; John A. Lee, Warehouseman; and Elwin C. Fricke, Warehouseman.

Le Roy Thomas, Senior Draftsman, wo
project. Thomas is also District Rep

gineer, and M. F. Lowe, Special Foreman, dis- J. S. 277.

Working on a right-of-way map in the Residency Office in Uvalde are H. C. Brown, Draftsman; John R. Green, Chief Inspector; and R. M. Baxter, Senior Draftsman.

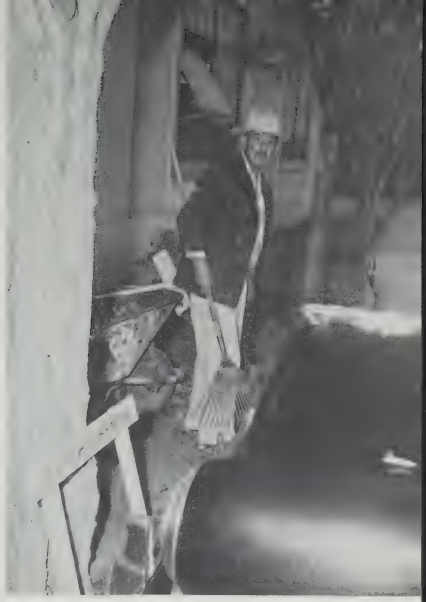
on an estimate for a special r for TEXAS HIGHWAYS.

Stenciling route markers for loop to Judge Roy Bean's Court are, left to right, Skilled Laborers Louis Salvatierra, Everett R. Babb, William M. Burk; and Semi-skilled Laborer Santa Ana S. Hernandez.

A Caterpillar motor grader gets its internal problems solved by Skilled Laborers Arturo L. Padilla, Cap V. Fellows Jr., and H. H. Petty.

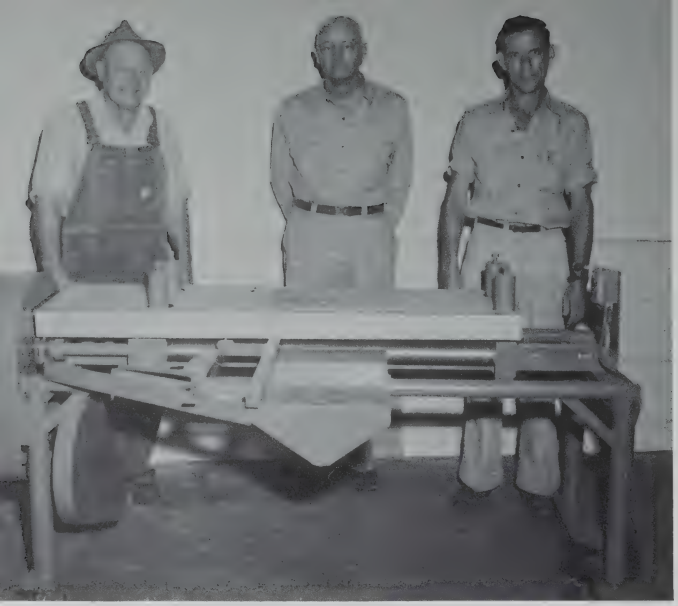
The foundation of the old maintenance warehouse in Brackettville gets a clearing. Left to right are J. C. Ayres, Senior Maintenance Foreman, and Claudio L. Arredondo, Common Laborer.

Rattles from the snakes that were killed near the Del Rio Residency are handled respectfully by James H. Averill, Engineering Assistant, and Robert E. Bradley, Senior Engineering Assistant.



The grounds around the District warehouse get a clean-up job by Refugio Ramos, Common Laborer.

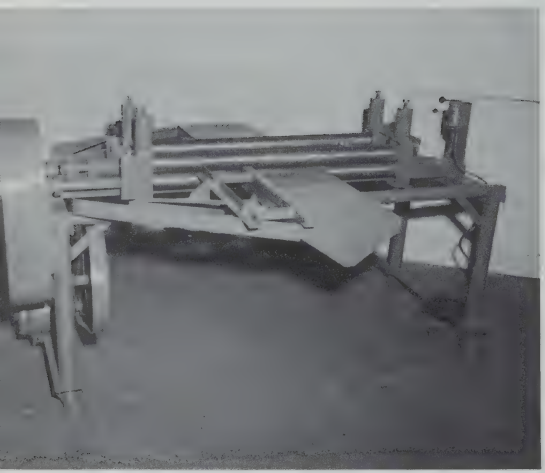
Edwin J. Bednarz, Skilled Laborer; and George D. Fisher, Senior Shop Foreman, look up from their project of repairing a mowing machine and tractor.



Standing behind the roller they made are, left to right, Special Foreman A. M. Quist, Senior Shop Foreman T. W. Cox, and Machinist Pat Arhelger.

Edge rollers smooth out the irregularities on the edges of the sign blanks.

A mechanical process for smoothing sign blanks, developed in the Camp Hubbard Shops, has speeded up production.



The four motivating rollers which force the sign blanks between the edge rollers can be seen.

Senior Equipment Supervisor J. D. Gibson is shown with the roller upon its completion.

Sign Blank SMOOTHER

Eugene G. Cusmod, Equipment Analyst
Equipment and Procurement Division

Prior to the use of the silk-screen process for painting sign blanks, the only processing necessary for preparing signs for shipment to the districts was the clipping of the corners, punching of the holes, and plating. With the advent of the silk-screen printing process now widely used, the burrs and slivers on the edges of the sign blanks have to be filed off to prevent tearing of the silk screen. This procedure requires time since each individual blank has to be checked for such irregularities, and when found, all edges on both sides of each blank have to be filed by hand.

Using the 24-inch by 24-inch sign blank as an example, the average production of the plating plant before filing became necessary amounted to 360 blanks per eight-hour day. As a result of the extra time required to file these blanks, this production figure was reduced 40 per cent, with only 216 blanks being plated during an eight-hour day.

From the time that smoothing the edges of these blanks became a part of the plating process, it was felt that there should be some method faster than individual filing to accomplish the desired results. After several ideas were put to the test and found to be impractical, T. W. Cox, A. M. Quist, and Pat Arhelger of the Camp Hubbard Machine Shop, along with Edgar Neumann, in charge of the plating plant, devised and fabricated a rolling device which has proven an answer to the problem.

This device is powered by a one-fourth horsepower electric motor and consists of four motivating rollers which move the sign blank between two heat-treated rollers. The edge rollers, shaped like V-type pulleys, are pressed against the edges of the blanks by means of strong coil springs encased in metal cylinders behind the rollers. These springs push the rollers against the edges of the sign blanks in sufficient force to eliminate most, if not all, irregularities present.

The edge rollers are adjustable to permit processing of the various size blanks, and since only two edges can be smoothed at a time it is necessary to run each blank through the roller once for each two sides. Square and rectangular blanks must be rolled twice, while octagonal-shaped blanks must be rolled four times. Very small, shield-type, round, and triangular sign blanks must still be filed individually as the roller will not accommodate them. However, use of this shop-made roller has increased production 66 per cent, and again an average of 360 of the 24-inch by 24-inch sign blanks can be plated during an eight-hour day.

Materials and Tests Man Receives Research Board Award

K. B. Wood (right), professor at Purdue University and chairman of the Highway Research Board for 1956, congratulates Chester McDowell after presenting him with the Highway Research Board Award.

Chester McDowell, Senior Soils Engineer in the Austin headquarters laboratory, has been given the Highway Research Award, one of two awards made each year by the Highway Research Board of the National Research Council.

The award, conferred for the best paper given at the preceding annual meeting of the Research Board, was presented to McDowell on January 8 at the opening session of the 1957 meeting held in Washington, D. C. His paper on "Inter-Relationship of Load, Volume Change, and Layer Thickness of Soils to the Behavior of Engineering Structures" was one of hundreds of papers presented at the meeting last year.

The second award, the Roy W. Crum Award, went to F. N. Hveem, Materials and Research Engineer with the California Division of Highways, and developer of the Hveem Stabilometer. This award, which is given in recognition of outstanding achievement in the field of highway research, is named in honor of the late director who served the Research Board for 23 years.

The Highway Research Board was organized in 1920 to encourage research and to provide a national clearing house and correlation service for research activities and information on highway administration and technology. These yearly meetings are the principal mechanism whereby scientists and engineers present their findings in highway research and hear them discussed by other experts in the field.

McDowell has been a member of the Flexible Pavement Design Committee of the Board for the last ten years and his work in the field of soil stabilization was recognized recently when he was appointed chairman of a soil stabilization committee. As a member of the Pavement Design Committee he has contributed a number of reports both to the committee and to the annual Highway Short Course held at Texas A. & M. College.

His efforts received further recognition when his developments in tests for control of compaction of subgrades and flexible-base materials led to his selection as a member of a special soils advisory panel for the $14 million road test project now under construction by the American Association of State Highway Officials near Ottawa, Illinois.

For the last 20 of his 29 years with the Highway Department, McDowell has been active in the development of soils engineering and has been instrumental in developing triaxial tests and soil mechanics and in introducing them into many Texas and Louisiana district laboratories. Better foundations for pavements and structures have become a major factor in the design of highways as a result of this.

McDowell, a registered professional engineer, is a member of the Soil Mechanics and Foundations Group of the Texas Section of the American Society of Civil Engineers. A native Texan, he studied engineering at John Tarleton Junior College and the University of Texas. After spending several years with the Department on location and construction of highways, McDowell became interested in soils engineering and most of the time during the last 20 years he has been with the Austin headquarters laboratory of the Materials and Tests Division.

Highway Research Board Award

presented to

Chester McDowell

by the

Highway Research Board

of the

National Research Council

In recognition of a paper of outstanding merit entitled

Inter-Relationship of Load, Volume Change and Layer Thickness of Soils to the Behavior of Engineering Structures

and presented at the 36th Annual Meeting of the Board

Given at Washington, D. C. this eighth day of January 1957

K. B. Wood
Chairman of the Board

Director

1957 ROAD SHOW DRAWS 67,000

The American Road Builders' Association Road Show, January 28 through February 2, drew some 67,000 road builders to Chicago's International Amphitheater.

Held every four years in Chicago, the Road Show is sponsored by ARBA, and the Construction Industry Manufacturers' Association manages the exposition. This year's show revealed the widest range of road-building equipment ever assembled in an indoor exhibit. Known as the World's Fair of the Construction Industry, the Road Show exhibited the newest and the best in road-building equipment — the products of 250 manufacturers of equipment and 60 producers of highway materials and supplies. The amphitheater which housed the equipment is the world's largest, and is spread over an area large enough to hold twelve football fields.

D. C. Greer, State Highway Engineer, was named to the ARBA Board of Directors at the 1957 meeting.

Four national associations held annual conventions in conjunction with the Road Show—the ARBA, the Associated Equipment Distributors, the International Road Federation, and the National Bituminous Concrete Association.

Roger Spencer, of Maintenance Operations Division, appeared on a seminar for foreign engineers sponsored by the International Road Federation. Spencer's speech concerned highway maintenance practices, and was translated into Spanish and French for those attending the seminar.

There were representatives from every state, and 1,500 delegates from 60 foreign nations at the Road Show. Attending from the Highway Department were Spencer, who went to the IRF meeting; and John Nations, Director of Equipment and Procurement Division; Charles W. Smith, District Engineer of District 4; and F. M. Davis, District Engineer of District 15.

German Engineers Visit Texas

Thirteen German engineers who attended the Road Show in Chicago were guests of the Department in Austin on February 8, inspecting Texas road construction.

Ed Bluestein, District Engineer of the Austin District, conducted the engineers on an observation tour of construction projects in the Austin area. Austin was one of the stops included in a tour under the direction of the Trade and Industry Tours Association.

Many of the men represented general contractor firms in Germany, and some represented road machinery companies.

Seated left to right in the Little Hearing Room of the Main Building in Austin are Reiner Wilkens, Carl H. Heise, J. C. Schlephorst, Manfred Steidle-Sailer, Rudolf Riedel, Otto Kurz, Ludwig Fischer, Hans Willrodt, Dr. Hans-Juergen Ganss, and Albert Reinberg. Standing are Guenther Roemling, Rudolf Schirmer, and Dr. Lilienfeld, interpreter.

JOHN BLAIR RETIRES; C.B.THAMES NAMED

in district 17

John E. Blair, one of the real old-timers with the Highway Department, retired on February 11, but will remain with the Department on modified service.

For 22 years District Engineer of the Bryan District, Blair went to work for the Department in 1918 as a draftsman in Austin. He served as District Engineer at Bryan from 1927 until 1938, then for a short time acted as temporary District Engineer at Corpus Christi. He returned to Bryan as District Engineer in 1945.

During World War I Blair served as an engineer officer and in World War II he was a lieutenant commander in the Engineering Corps of the Navy.

New District Engineer for Bryan is C. B. Thames, formerly Assistant District Engineer there. He has been with the Department for 32 years, and most of his work has been in the Bryan District.

Thames first worked with the Department in the summer of 1922 as a rodman in Bastrop County. After receiving a civil engineering degree from the University of Texas in 1924, he entered the regular service of the Highway Department, and has since served in various capacities.

Thames served four years as a captain in the Engineers during World War II.

Employees of District 17 presented Blair with a plaque expressing their appreciation to him. They also gave him a 21-inch, remote control Zenith Television set. Blair retired on his birthday, and received a birthday cake along with his television set and plaque.

New District Engineer C. B. Thames discusses the plaque presented to John Blair by District 17 employees.

Blair admires the birthday cake which went along with retirement festivities.

This model, housed in the National Museum in Washington, depicts in detail the methods and equipment used in building this famous old road.

The Appian Way

This queen of highways, begun about 312 B. C., is still in use today in places.

Tom H. Taylor, Superintendent
Information and Statistics Division

Great empires have risen and fallen but in their ruins they left many contributions; monuments to their greatness. The Pharaohs of Egypt left the mysterious pyramids, the Chinese left blasting powder and the magnetic compass. The Romans, mightiest empire of them all, gave the world a concept of building roads, and left the greatest highway ever constructed — the Appian Way. Called the queen of them all, the Roman Via Appia was built over 2,300 years ago and is without peer among the roads of the ancient worlds.

The Appian Way was laid out in 312 B.C. under the order of the censor Appius Claudius and continued to grow with each century. It was built by stage construction, first as an earth road, next surfaced with gravel, and finally paved with hard flint lava.

Photographs Courtesy Bureau of Public Roads

Via Appia was one of the 29 great military highways radiating out from Rome toward its far-flung frontiers, and a vital commerce route for trade with the Far East. It is said to have gotten its title of "Queen of the long distance roads," because it was so vital in nurturing Rome's commerce, and also because its graceful sweep had a feminine charm.

A road such as this in times before large construction machinery was in use can be visualized only by realizing that time was of little consequence, and an endless supply of slave labor was available.

A four-lane highway 35 feet wide, the Appian Way extended some 412 miles from Rome to the active harbors of Hydruntum. The two-way central lane, or agger, was fifteen and one-half feet in width, flanked by curbs (crepidines) two feet wide by eighteen inches high. These were paralleled by one-way side streets (margines), each seven and three-fourth feet in transverse section. The center lanes were reserved for vehicular traffic, while the two outside lanes were primarily for pedestrian traffic. It was, possibly, the first road ever built using the idea of controlled access. The curbs separating the two outside pedestrian lanes insulated or partially controlled the two center lanes. The estimated cost per mile to reproduce this road today in the United States is more than a million dollars a mile.

The road was built by first excavating a trench in the natural soil down to a solid foundation. The earth was tamped and covered with a light bedding of sand or mortar, upon which was laid four main courses. First was the statumen layer of large, flat stones ten to twenty-four inches thick. Next came the rudus course of smaller stones mixed with lime, some nine inches thick. This was followed by the nucleus layer, about one foot thick, consisting of small gravel and coarse sand mixed with hot lime. On this fresh mortar was placed the summa crusta, or wearing surface, of

The lectica was used for transporting massive stones. The horizontal bars had cleats to keep the load from slipping, and four vertical bars were attached at each end to support the weight, enabling the carriers to rest at every opportunity.

Mortar is being applied between thick courses of stone. The roller was used to compact a course of small flint rock which served as pavement on each of the outer lanes.

This instrument, a chorobates, was used for leveling hydraulic radiants. The instrument was level when the two plumbs coincided; however, in windy weather, water was applied in the trough in the center of the rod to assist in leveling the instrument.

flint-like lava about six inches deep. Total thickness of the four courses varied from three to five feet.

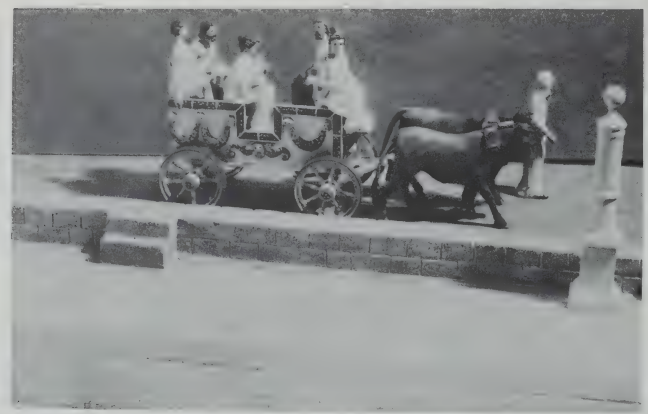
Indications show that a very short distance separated the surveying and grubbing from the finished road. This was largely due to their lack of heavy equipment designed for production, and their limited or short-range engineering instruments. In spite of their crude instruments the engineering accuracy and surveys were remarkably correct and efficient by today's standards. The range of their instruments was restricted to the vision of the naked eye. Magnification by telescopic sights was not invented until 1608.

The Roman engineer studies the crude maps and plans. Despite the fact that maps, plans, and engineering instruments were limited and crude, the accuracy and efficiency of the end results obtained by the Roman engineers were miraculous.

A groma—the ancient Roman engineer's best friend. This crude instrument was effectively used for alignment and as a level.

Typical construction activity. In contrast to today's methods of construction, a distance of only a few feet separated the preliminary engineering and grubbing and the finished highway.

Digging the trench to solid foundation called for rugged men and equipment. Oxen were used for pulling crude wheeled plows for excavation.

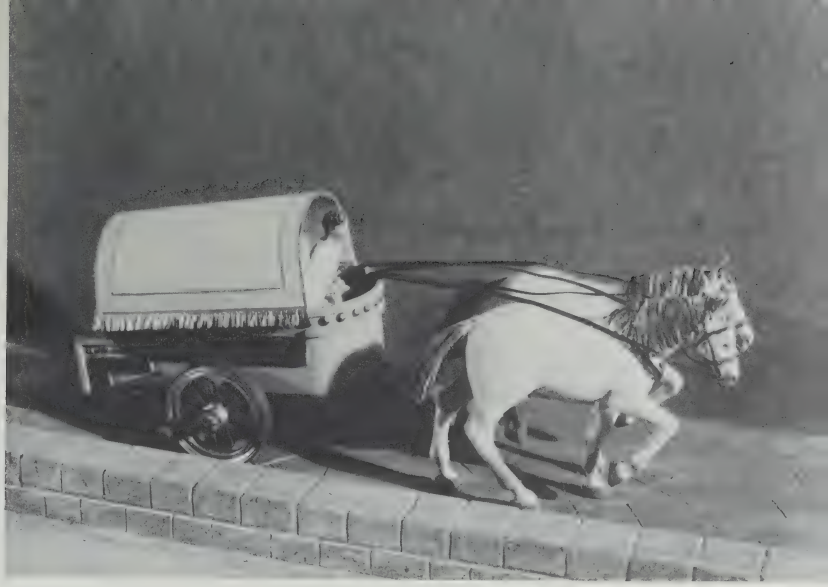


The rheda, a type of four-wheeled wagon, was popular for hauling passengers as well as heavy freight. These vehicles were pulled by either horses or oxen.

There was no evidence of the use of the compass by Roman surveyors, although it was known to the Chinese for two thousand years before Christ. The Romans had only a few crude maps of large areas laid out by latitude and longitude. They used a device similar to our plane table, but the art of distance measurement by stadia cross hairs—tachymetry—was not invented until the Seventeenth Century. Their entire astronomical and geographical outlook was circumscribed by the idea of an earth-centered universe and a rigid Euclidean geometry excellent for earth measurements but elementary when projected into space. They understood a great deal of algebra and trigonometry, and some of the rudiments of calculus.

The Roman farmer carried his produce to market in side baskets on the back of the popular pack animal.

Dirt hauling was essential then as now in building a road. Baskets which held about one yard were used and were transported on a flat two-wheeled cart.



This two-wheeled, horse-drawn vehicle, called a carpentum or chariot, provided the most popular mode of transportation. It usually held two riders who entered the vehicle from the back. Roman horses used were of a stocky breed known for their stamina.

A beggar holds out his cup to passing pedestrians traveling the Appian Way.

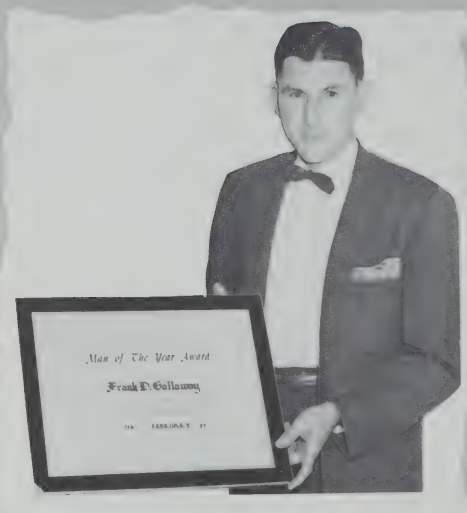
Rules and regulations governing traffic on the Appian Way were enacted and enforced. For example, a fast reda (a large four-wheeled wagon) had to be drawn by eight horses in summer and ten in the winter and could not haul a load in excess of 718 pounds. For hauling slow freight the load could be quadrupled. Average speed of travel ranged from fifteen miles per day for heavy freight loads to 75 for the fast post drivers. With the aid of relays government officials on urgent business are supposed to have covered as much as 184 miles in 24 hours.

Signs along the Appian Way informed travelers the distance to Rome, and in some instances gave the time required to reach the next village.

This massive, expensive method of road construction was accepted as standard for more than twenty centuries. Only during the past century and a half have significant changes been made in the construction of highways. During the nineteenth century an Englishman named John McAdam discarded the massive stone idea and proved that a more practical and economical road could be built with a thin paved surface laid over a raised and compact earthen surface. Strange as it sounds, there have been only two major concepts of road building universally accepted — the McAdam theory which in less than 200 years has become standard, and the Roman concept, used on the Appian Way.

Through the centuries the Appian Way withstood the fury of nature and treading of man. It served long and well as an artery of commerce and defense . . . a monument without peers among the roads of the ancient world.

Highway in the News



The highlight of this, and every other chamber banquet, was the naming of the Man of the Year for Polk County. Mayor Cochran introduced the Man of the Year for 1957 as Frank Gallaway, Mayor Cochran stated Frank had been born in Rusk County, and at an early age had moved to Waco where he attended school until he graduated in 1934. Frank attended Baylor University for one year, then had to quit his education for a year in order to make enough money to attend the following year. Mayor Cochran said, "The story of Frank's education shows the mettle of which he is made. Frank was so interested in getting his education that he went to school one year, then worked for one year to make enough money to pay his expenses for another year of school."

After attending Baylor for one year, Frank found he could not take the necessary subjects there for a degree in engineering, so he transferred to Texas A&M where, after many years of hard work he received his degree in engineering in 1943.

Said Mayor Cochran, "When Frank moved to Livingston he further showed his fine character in not just sitting back waiting to be asked to take part in the community projects and life, but jumping in and making friends and working hard for the betterment of both the community and Polk County."

Last year Frank drew the plans and specifications for the Youth Center, Inc., Swimming Pool, then put in more than 1,000 work hours in actual construction of the swimming pool.

Frank is now a member of the board of Deacons in the Central Baptist church; past president of the Polk County Chamber of Commerce and Livingston Rotary Club; resident engineer for the Texas Highway Department, and a beloved friend and neighbor to all who have ever come in contact with him.

OF ABILENE FOLK

Family Album

CONSERVATIVE — Born near Memphis, Tex., this boy started to school when he was 8 and liked it from the start. Public speaking became his favorite subject, and he had an ambition to become a lawyer, but when he finished high school at 17 and started to college he decided to go in for civil engineering instead. Always conservative with his money, he was handed his own checkbook when he left for college, and was on his own from then on. He returned on a Saturday night after completing his college work at Texas A&M, and went to work on Monday morning. He is still working for the same organization, though he has gone up in his profession. Shortly after his marriage he moved to Abilene and still resides here. On the side he is a farmer and stockman. He has been a member of the Methodist Church since he was 12 years old. A more recent picture of him appears on page 12-A.

DISTRICT ENGINEER — J. C. (Jake) Roberts, district engineer for the Texas Highway Dept., is the man whose boyhood picture appears on page 1-A today in the family album. He was born and reared near Memphis, Tex, attended Memphis public schools, then went to North Texas Agricultural College and Texas A&M. His hobby is fishing.

OVER THE HIGHWAYS

Comments . . . from the Traveling Public

● A suggestion—at every entrance to the state, have a large billboard sign of state showing main routes and radio station with frequencies so that motorists can keep posted on weather reports, etc.

Vern Laister
Clinton, Ontario, Canada

● Texas highways were the best on our trip from Iowa. . .

Williamsburg, Iowa

● Some of your highways have poor, or no pavement on shoulders. . .

J. E. Dial
Inyokern, California

● We think that the state of Texas and its highways are among the finest anywhere. Your Information Bureaus render a great service to travelers.

Arlington, Virginia

● Texas has the best roads we found in all our traveling in many states. The map service at Denison was very much appreciated.

Story City, Iowa

● We disliked the desert travel with no road stands for shelter from dust storms. There were no phones on desert roads, no car emergency on long stretches of road.

Baltimore, Maryland

● Conditions of roads were best we have ever seen in our travels. We liked the variety of scenery. It seems that some of the roadside parks could be improved by the addition of water facilities and trash disposal containers.

Chicago, Illinois

● I, the undersigned, would like to have some information on a friend I have lost somewhere in Texas. I had his address, but misplaced it. You see, I met this buddy friend in the year 1944 to 1948. We happened to meet in Camp Fort Eustace, West Virginia. He was in the American army, while I was in the British army. I do believe he is a boxer and happens to have a ranch in Texas. His name is Willie Ross. After he left Camp Fort Eustace, he went to a camp a little way from Texas.

Leslie Percival
Georgetown, British Guiana

■ *The trail is wide, but if anyone has seen Willie, let us know and we will pass the word along.*

● Could you please inform me on the mailing address or whereabouts of the Ritter-Wyman Ranch?

Ted Ritter is the gent who won the Old Gold Title Contest and won $20,000. He used to grow cantaloupe and may still be doing it. The ranch house is an old southern-style colonial type house. Beyond that, I do not remember what town or county the ranch was located in. I do remember that it was located on a road bordered by giant post oak trees for miles and miles and that it is four, five, or six miles from a nearest town, the name of which always escapes me.

Walter Edward Wyman
Boston, Massachusetts

■ *Someone might start a lucrative business finding men lost somewhere in the wilds of Texas. Watch for those trees or empty Old Gold packages in your travels!*

● Just a note to say how much the Baker family from Uvalde appreciates the wonderful highways and clean, convenient roadside parks we have in Texas. On our vacation we traveled through eight states and only one could compare with Texas. We Texans take these parks and highways for granted.

We shall do all we can helping you to keep them clean, and thank you for your foresight in your planning and construction of these wide, smooth highways and nice roadside parks.

Mrs. W. T. Baker
Uvalde, Texas

● While looking for a filling station in the early morning recently and finding none open, I wondered whether or not it might be plausible for your Department to maintain coin-operated gasoline pumps, located strategically along the highways.

Mrs. Alexander M. How
Harlingen, Texas

● Recently the stretch of highway between ..... and ..... was repaired. Since then it has become a hazard because when trucks and cars pull over on the graveled part on either side to let other cars pass, rocks are thrown into windshields. This week I have had five nicks and one bad crack made in my windshield on this road.

If you could talk to others traveling this road I'm sure you would be convinced that this is not a crank letter, but a serious matter which should be attended to soon.

(Signed)

To and From Our Readers

THE NEW LOOK . . .

This doesn't look like your old TEXAS HIGHWAYS, but we hope you will feel that it has "grown up," retaining all that was good of the old and familiar, dressed in a new and better looking garb. The larger size is a move toward holding down production costs. We believe the new size will be easier to handle. We *know* it allows us to give you a better page layout.

This is just one more step for improving your magazine. From the very first issue it has been changing and growing to suit the needs as it gained wider popularity. The first issue came out in June 1950 under the name of Construction and Maintenance Bulletin. It was published bimonthly until August of 1952 when it became a monthly. In November of 1953, still having growing pains, C & M became TEXAS HIGHWAYS.

From the beginning, the bulk of the material that has appeared in the magazine has come from our field personnel. This policy will be continued. To retain the quality that was inside but improve the "wrapping" is our aim. We would like to know how you feel about the new size. Mail your comments to the Editor, TEXAS HIGHWAYS, Information and Statistics Division, Texas Highway Department, Austin, Texas.

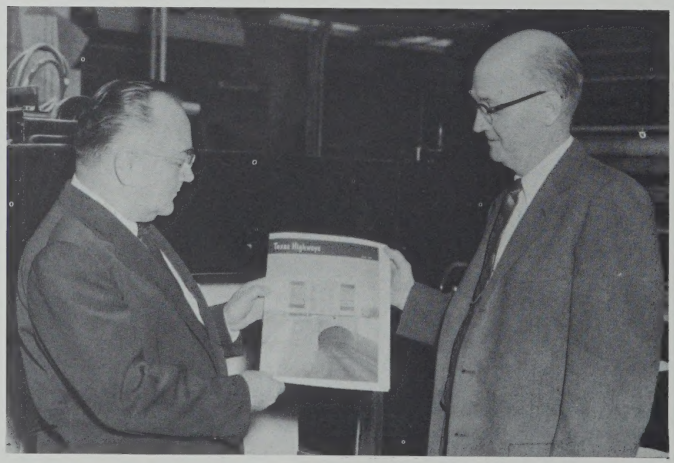
● Your most recent edition contained a group photograph of the District Engineers as well as other very interesting features.

Inside the back cover and under the heading "A Slip-up," you have made a correction and apology for the error.

I would like to know for whom was the apology intended?

L. D. Cabaniss,
District Engineer
Paris, Texas

■ *Now that we think about it, the gentlemen in question could apologize to us for moving and causing our mistake. District Engineers are supposed to be steady men. Who would have expected a fast switch like that?*



Fred T. Bennett, Engineer of Information and Statistics Division, looks over a cover page for this issue of TEXAS HIGHWAYS as it rolls off the presses at Steck Company. L. V. Bearden, of Steck Company, stands by.

ABOUT THE COVER

This modernistic building sits atop the Baytown entrance to the Baytown-La Porte Tunnel, the only underwater crossing on the Texas Highway System.

Now more than three years old, the tunnel can still boast a clean record accidentwise. There has never been a fire and there has been only one very minor accident in the tunnel since its opening. However, all emergencies have been anticipated and prepared for in case they should arise —the guards will even serve as chauffers for victims of claustrophobia. Equipment for handling such emergencies and routine maintenance of the tunnel are described in an article by Foyest W. Brown on page 2.

TEXAS HIGHWAY COMMISSION

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Texas Highways

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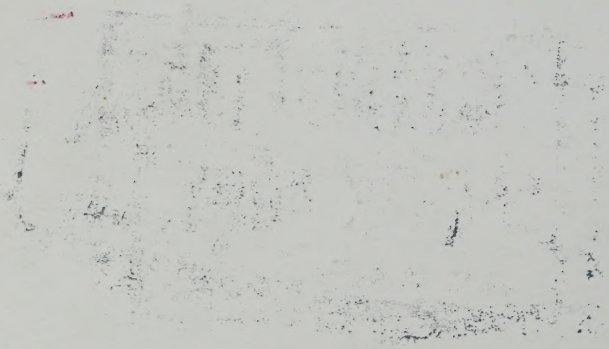
Do You Know Texas ?

Every locality has its official harbinger of spring—the first robin, the first crocus. In East Texas the dogwood gives the signal for that proverbial fancy to start turning to other thoughts. It grows profusely throughout the forest regions of the eastern part of the state, and the last days of March and the first of April find the forests resplendent with millions of dogwood blossoms. Dogwood blossom time gave rise to two celebrations that have become traditional in East Texas. In March the Tyler County Dogwood Association holds its annual festival and pageant at Woodville. Trails through the woods make it possible for visitors to see one of Nature's spectacular shows. Then in late March or early April, Palestine and Anderson County open their Dogwood Trail. More than 100,000 persons make this pilgrimage each year. Not far from Palestine, at Rusk, stands this tree, the king of the dogwoods. Believed to be the largest in existence, it is a show in itself.